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Manatū Ōhanga
Intellectual Property Office of New Zealand

CERTIFICATE

This certificate is issued in support of an application for Patent registration in a country outside New Zealand pursuant to the Patents Act 1953 and the Regulations thereunder.

I hereby certify that annexed is a true copy of the Provisional Specification as filed on 20 March 2000 with an application for Letters Patent number 503480 made by COMPUDIGM INTERNATIONAL LIMITED.

Dated 10 October 2003.

Neville Harris
Commissioner of Patents, Trade Marks and Designs

COMMISSIONER OF PATENTS, TRADEMARKS & DESIGNS
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503480

Patents Form No. 4

PATENTS ACT 1953

PROVISIONAL SPECIFICATION

SPORTS DATA VISUALISATION SYSTEM AND METHOD

We, **COMPUDIGM INTERNATIONAL LTD.**, a New Zealand company of Level 16, Compudigm House, 49 Boulcott Street, Wellington, New Zealand do hereby declare this invention to be described in the following statement:

SPORTS DATA VISUALISATION SYSTEM AND METHOD

FIELD OF THE INVENTION

The invention relates to a sports data visualisation system and method.

BACKGROUND TO INVENTION

It is becoming increasingly common to collect large volumes of data each time a game of sport is played. For example, a game of rugby union generates statistics such as the total number of points scored, the number of tries scored and the number of tries scored which are then converted. Other statistics include ball possession representing the proportion of the game during which a particular team had possession of the ball.

There is an increasing trend toward analysis of collected data with a view to analysing opponents strategies and as a coaching aid in assessing the strengths and weaknesses of a particular team. It is also especially desirable with televised sports to present the collected data to spectators in a form which is easily interpreted.

SUMMARY OF INVENTION

In broad terms the invention comprises a sports data visualisation system comprising a memory in which is maintained a database representing a sports event; display means arranged to display a graphical representation of a sports venue at which the sports event is held; retrieval means arranged to retrieve from the database data representing the sports event; and report generating means arranged to display a contoured representation of the data retrieved from the database on the display means.

In broad terms in another form the invention comprises a sports data visualisation computer program comprising a memory in which is maintained a database representing a sports event; display means arranged to display a graphical representation of a sports venue at which the sports event is held; retrieval means arranged to retrieve from the database data representing the sports event; and report generating means arranged to display a contoured representation of the data retrieved from the database on the display means.

In broad terms in another form the invention comprises a sports data visualisation method comprising the steps of maintaining in a memory a database representing a sports event; arranging display means to display a graphical representation of a sports venue at which the sports event is held; arranging retrieval means to retrieve from the database data representing the sports event; and arranging report generating means to display a contoured representation of the data retrieved from the database on the display means

BRIEF DESCRIPTION OF THE FIGURES

Preferred forms of the sports data visualisation system and method will now be described with reference to the accompanying figures, in which:

Figure 1 shows a block diagram of the system of the invention;

Figure 2 is a preferred form database schema;

Figure 3 is an example representation;

Figure 4 is one preferred method of data acquisition;

Figure 5 shows a preferred form query tool; and

Figure 6 is another screen of the query tool of Figure 5.

DETAILED DESCRIPTION OF PREFERRED FORMS

Referring to Figure 1, the preferred system 2 comprises a data processor 4 interfaced to a memory 6, the processor 4 and the memory 6 operating under the control of appropriate operating and application software. Stored in memory 6 is a suitable repository, for example, database 8. It is envisaged that the data repository may comprise a single database, a collection of databases, a data warehouse or a datamart.

The processor 4 is interfaced to an input device 10, for example, a keyboard, mouse, track ball and/or joystick, and a display device 12, for example a visual display unit or monitor. The processor 4 may also be interfaced to a secondary storage device 14

which may include a floppy disk drive, hard disk drive, CD-ROM or DVD. The processor 4 may also be interfaced to a printer 16.

Data obtained through the input device 10, from memory 6, and/or secondary storage 14, is displayed to the user on display device 12 or output to printer 16. The processor 4, memory 6, input device 10, display device 12, secondary storage 14 and/or printer 16 may be set up as a stand alone computer or may be connected to further components in a network. Networks may be of any type, for example, Internet, intranet, local area and wide area networks.

Figure 2 illustrates one preferred form of database schema 20. The schema 20 is shown as a single table in a relational database. It will be appreciated that this table could be normalised to an appropriate extent. It will also be appreciated that schema 20 could alternatively be represented in an object oriented form.

The schema 20 shown in Figure 2 is particularly suitable for strong data representing possession and territory in a rugby game. A typical record represents a time slice and may include, for example, a record identifier 22. The schema 20 may also include game identifier 24 to uniquely identify the particular sports event represented.

The schema may also include a possession field 26 which indicates which team is in possession of the ball in a particular time slice, a time and/or date indicator 28 and a half field 30 representing the half of the game represented by a time slice.

The schema 20 may also include geographic coordinates. The geographic coordinates shown in Figure 2 include x coordinates 32 and y coordinates 34 representing the geographic position of the rugby ball on the field in a particular time slice in the New Zealand map grid (NZMG) local coordinate system notation. It is envisaged that the geographic coordinates could alternatively be represented in Australian map grid (AMG) notation or as a latitude or longitude.

The preferred system comprises a display means arranged to display on display device 12 a graphical representation such as the graphical representation 40 shown in Figure 3. The preferred representation 40 shows a plan view of a rugby field showing boundary lines 42, territory lines such as the 22 indicated at 44 and the half way line indicated at 46. The representation 40 may also include goal posts 48

and 50. The representation 40 is an example of the sports venue or playing field on which the rugby game is played.

The system also comprises a retrieval means which is arranged to retrieve from the database 8 the data representing the rugby game. The retrieval means could be any one of a number of standard products for querying and retrieving data from a database.

As shown in Figure 3, the system includes report generating means which is arranged to display a contoured representation of the data retrieved from database 20 on the display device 12. it is envisaged that the contoured representation could be superimposed on to graphical representation 40 as shown in Figure 3. Alternatively, the contoured representation could be displayed adjacent to the representation 40, or as an alternate to the representation 40.

The preferred representation 40 is divided into a plurality of points. The number and spacing of these points will in each case depend on the result desired. A greater number of points will result in a more detailed representation whereas a fewer number of points will result in a less detailed representation.

In one preferred form, the total time that the ball is located at a particular point during a rugby game is calculated from data retrieved from database 8. In the contoured representation of Figure 3, the location of the ball throughout the game can be represented with x and y values being the geographic coordinates of the rugby ball and the z value being the total time, or a percentage or portion of the total time, that the rugby ball is located at point (x, y).

The contoured representation is preferably generated as a function of a plurality of (x, y, z) data points. One preferred form function is a thin plate spline arranged to calculate appropriate z values for each geographic co-ordinate on the graphical representation 40.

As shown in Figure 3, for example, the points shown at 52, 54 and 56 respectively indicate geographic locations in which the ball was located repeatedly during the game and areas such as 58 indicate areas in which the ball was not located at all, or not located to a noticeable extent, during a game.

It is envisaged that the contoured representations could be shown as single summary frames or stills or could alternatively be represented as a series of frames in an animated sequence or AVI. It will also be appreciated that the user may be provided with a query facility to select desired frames to display. Where an animated sequence is presented to the user, the user could be provided with the ability to select an appropriate time period to view and also be provided with the facility to control the rate or speed at which a sequence is displayed to the user.

It is envisaged that the nature and scope of data representing a sports event and the contoured representation of the data could be varied. For example, a contoured representation could be produced of ball possession during a rugby game. The ball possession of a particular team could be obtained by summing each time sequence in the database from the time a team acquires possession of the ball to the time the team loses possession. It will be appreciated that the database schema 20 could include one or more fields representing the nature of play at a particular time, for example, a scrum, maul, charge, line-out, mark, penalty or conversion. Furthermore, the magnitude and direction of change in the geographic position of the ball could be used to calculate the effectiveness of a scrum, maul or charge.

The system may additionally or alternatively be arranged to store in database 8 and represent on the display device 12 other statistics and key performance indicators (KPI's). For example, team KPI's could include the score, amount of possession, territory, the number of penalties conceded, scrums or mauls which are won or lost and line-outs which are won or lost. Individual player KPI's could include points scored, tackles made both successful and unsuccessful, handling errors, breaks or half breaks, yards gained in a charge, kicks/pass/run, turnovers, passes and tackles, penalties, dropped ball as a percentage per game from a pass or from a kick and charge downs.

The system could also store and present KPI groups such as a general overview, a first 5/8 view, forwards view, loosie view, back view and/or outside back view.

The system may also store other KPI's such as the number of kicks in a game, weather factors such as wind speed and direction, rain, sleet or snow, representations of the particular grass or soil, the captain and coach of a particular team in a particular game, and the nature of a game, whether it is a local or international challenge or whether it is a semi-final or final.

Figure 4 illustrates a preferred method of data acquisition arranged to capture data for storage in and subsequent retrieval from database 8. Actual footage of a recorded rugby game could be displayed in window 70 on display device 12. A graphical representation of the venue is also displayed on display device 12 in window 72. The representation shown in 72 is divided into a variety of points, each point representing a geographic location at the sports venue.

A user views video footage at window 70 and notes the position of ball 74 at a particular time. As ball 70 is moved around the playing area, the user operates input device 10 such as a mouse, track ball, joystick, or other suitable device to alter the position of cursor 76 in window 72. The position of cursor 76 is automatically recorded and the corresponding geographic position of the ball on the playing field is calculated from the position of the cursor 76 in window 72. In this way, the position of a ball through a game can be calculated.

It is envisaged that this data acquisition could be at least partially automated. For example, the location of the rugby ball in a plurality of time slices could be calculated using known image processing techniques. Successive images of the rugby field could be analysed and the ball identified in the images from the shape and/or colour of the ball.

The data acquisition steps could be further supplemented by manual techniques such as individuals viewing the game and keeping statistics, or by automated techniques such as by tracking movement with a suitable GPS system.

The database 8 could be arranged to store demographics player profiles, including for example, age, weight, tackles made, tries scored, total number of runs, number of times over the advantage line, whether or not runs lead to turnover, instances of dropped ball, instances of isolation, successful pass/hand-offs, type of run preferred (kick & chase vs break), total yardage gained in the run, and field position. The database could also store data on injuries, development, teams, referees and/or coaches.

Figures 5 and 6 illustrate a preferred form wizard for querying database 8. The user may focus on individual weights as shown in Figure 5 and/or individual ages as shown in Figure 6.

It will be appreciated that the contoured representations could be applied to a plurality of sports. With appropriate modification of the database schema 22, graphical representation of the sports venue, and the contoured representation, the system could be applied to sports such as rugby league, soccer, tennis, golf, gridiron, baseball, softball, Aussie rules, hockey, ice hockey and basketball. The system could also be applied to track and field athletics events and also horse and dog racing.

In a further form the invention could also be applied to simulated and actual military positioning. For example, the system could analyse the strategic positioning of troops for controlling areas of terrain.

The foregoing describes the invention including preferred forms thereof. The invention provides a user friendly system suitable for analysis of opposing teams, for use as a coaching aid, and for live viewing for spectators. Preferred forms of the invention may perform player profiling, track game development, pinpoint the circumstances leading to a player's injury, and assist coaches and sports management with assessing referee performance. Alterations and modifications as will be obvious to those skilled in the art are intended to be incorporated as in the scope hereof.

WEST-WALKER BENNETT

per

ATTORNEYS FOR THE APPLICANT

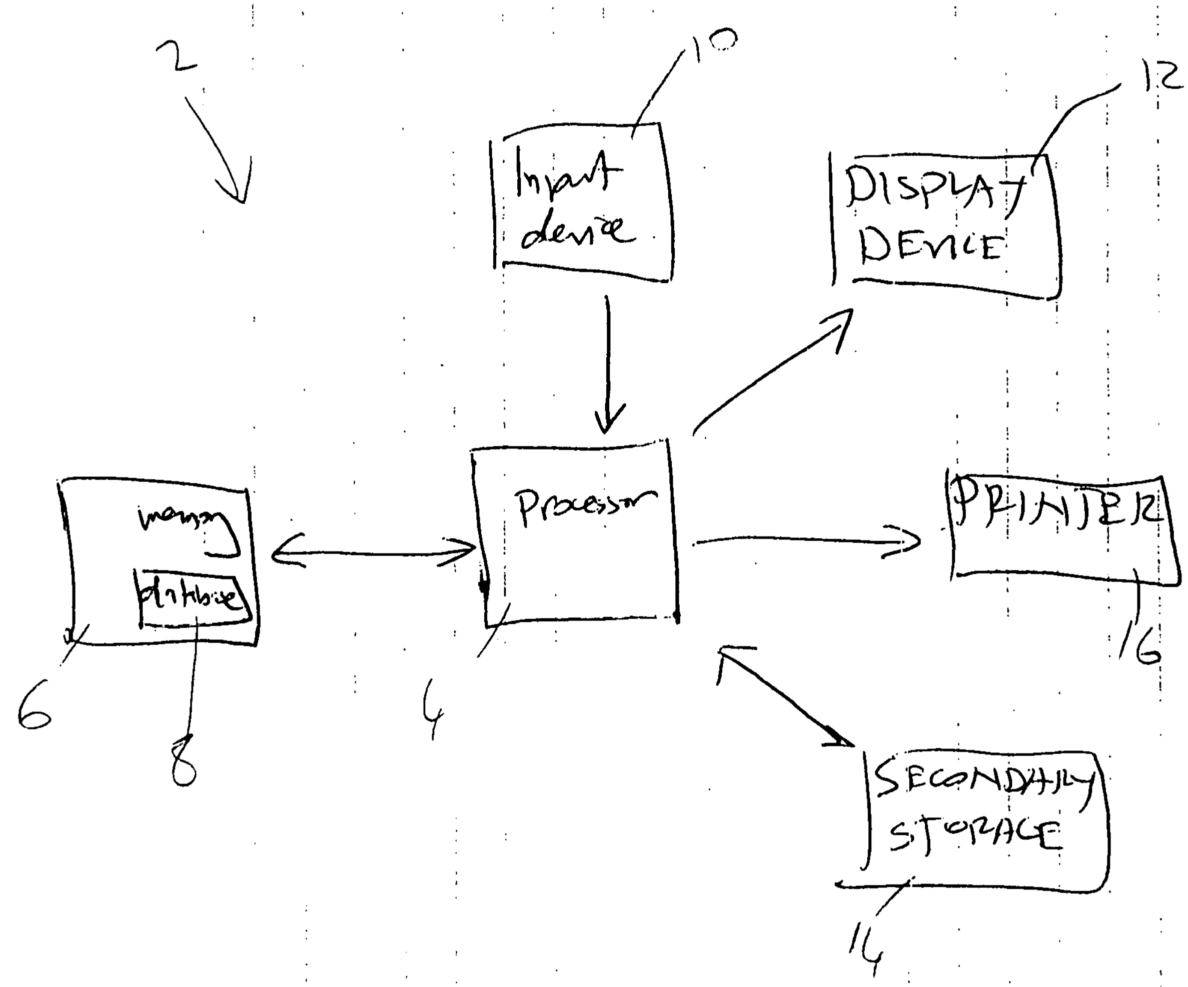

FIGURE 1

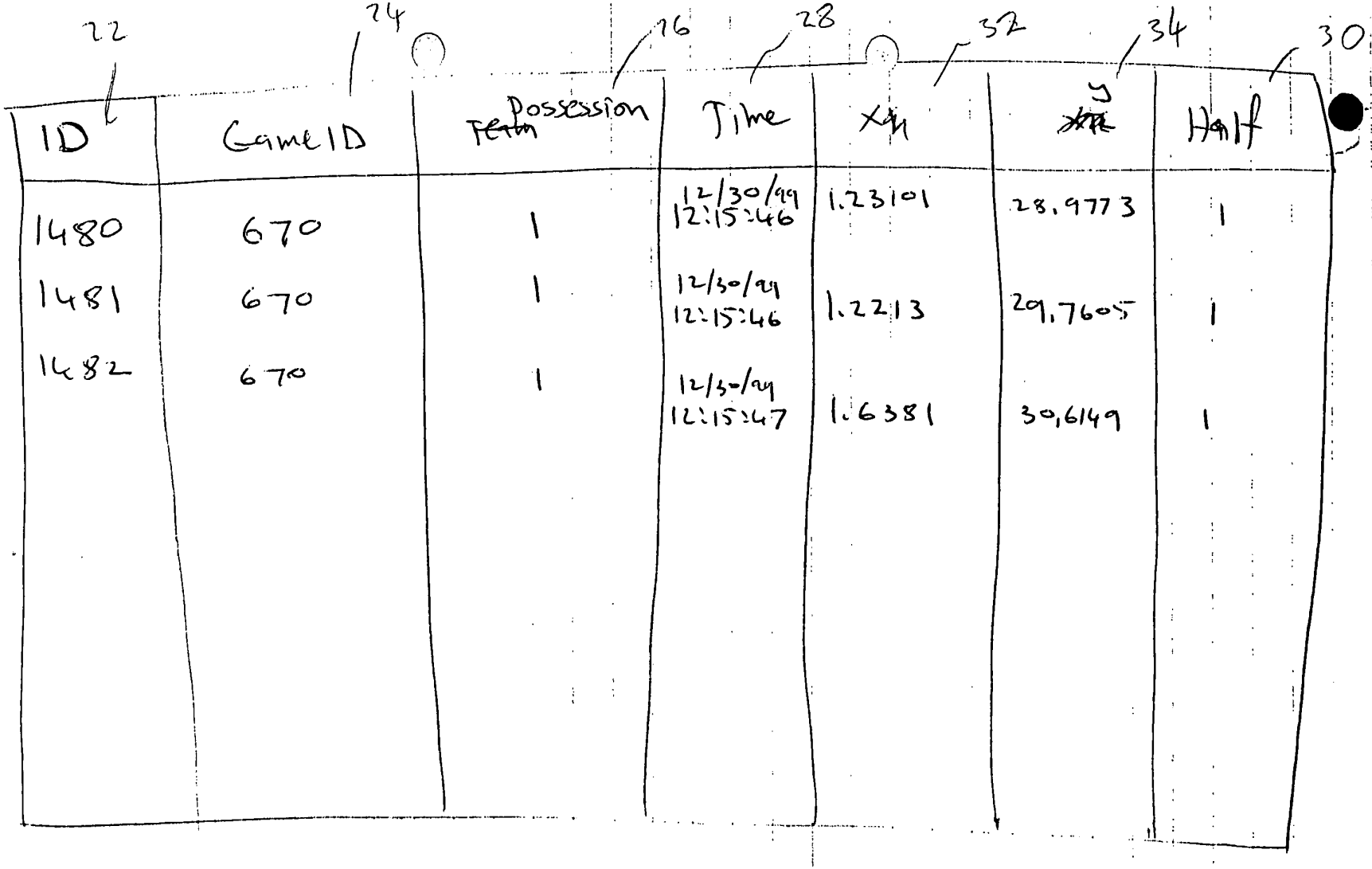
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FIGURE 2

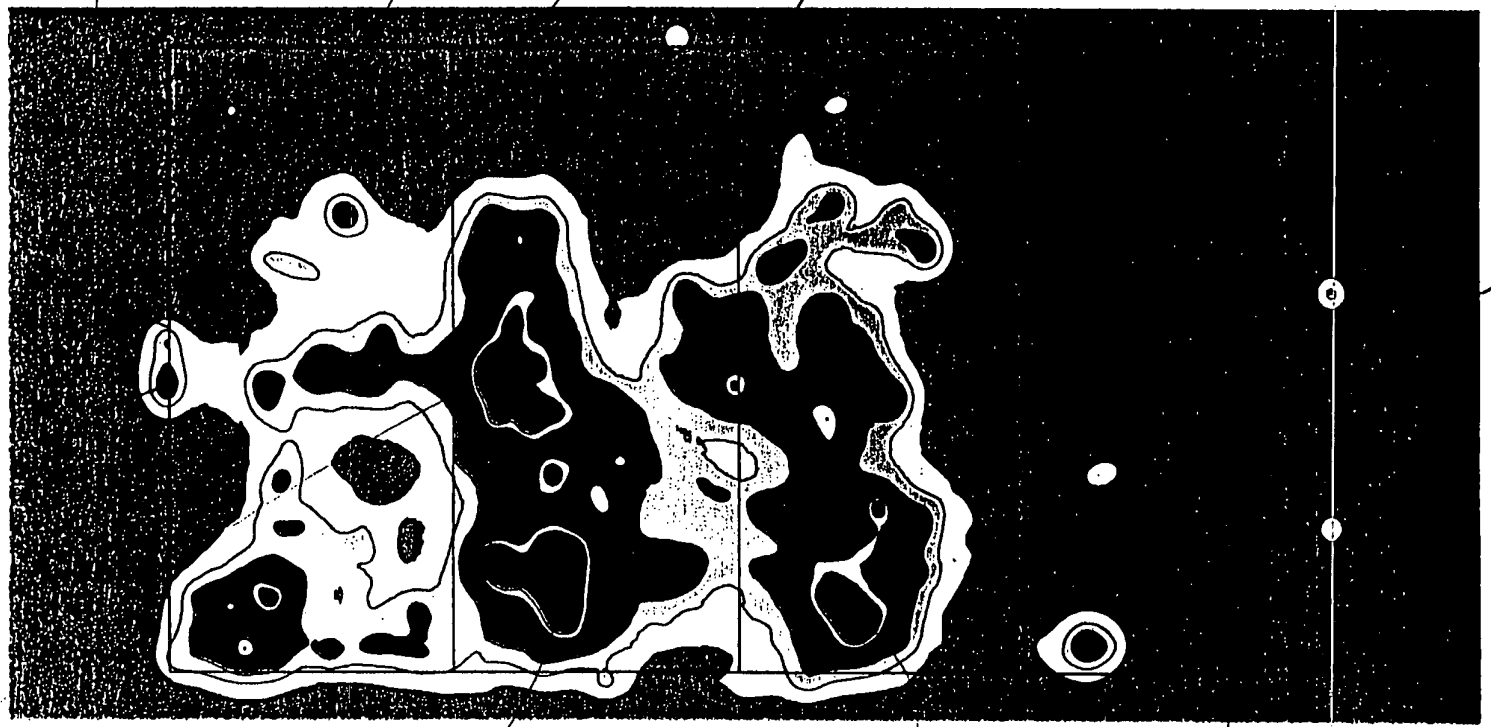

Figure 1: Ball position in a game of rugby.

FIGURE 3

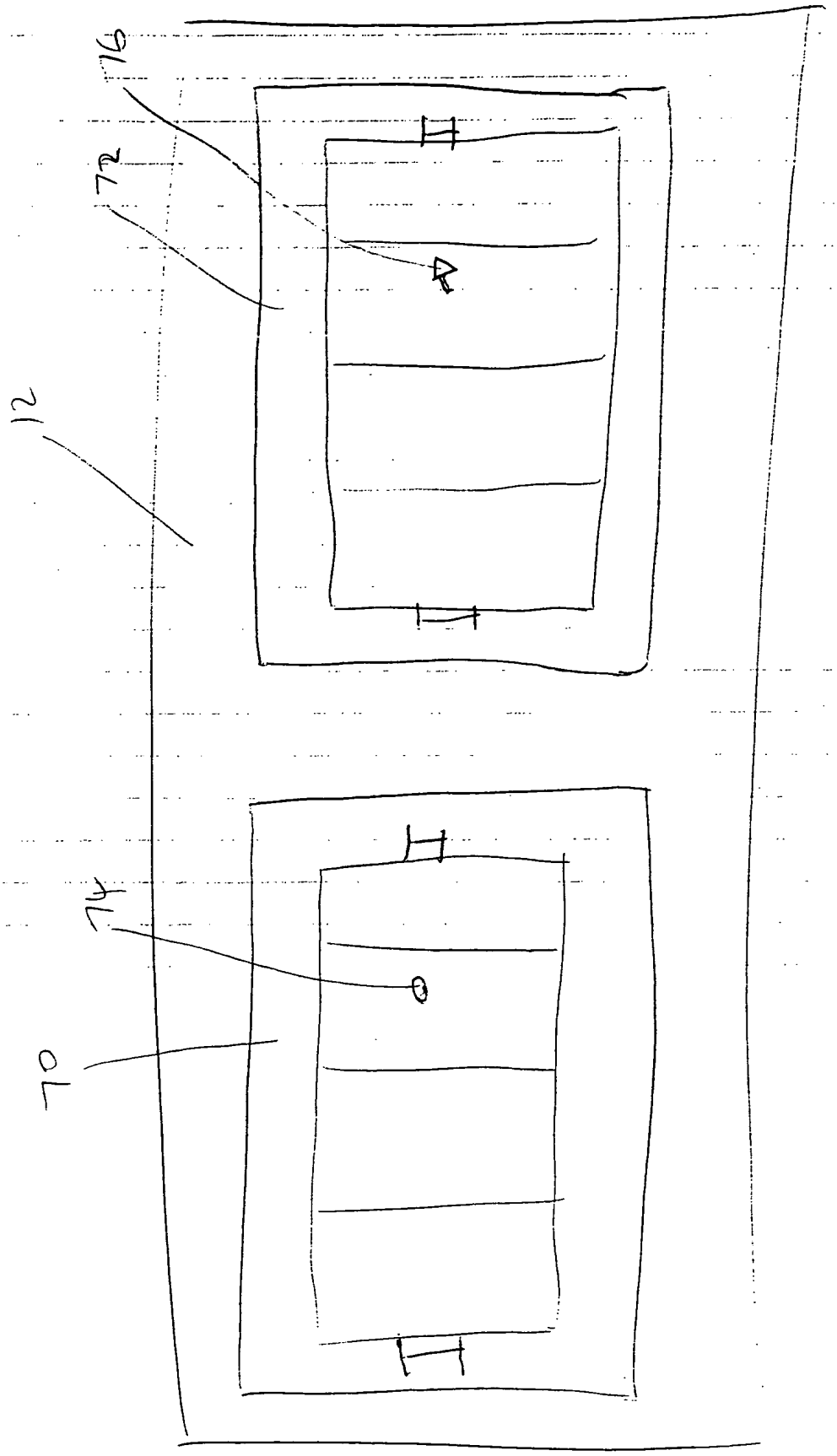

FIGURE 4

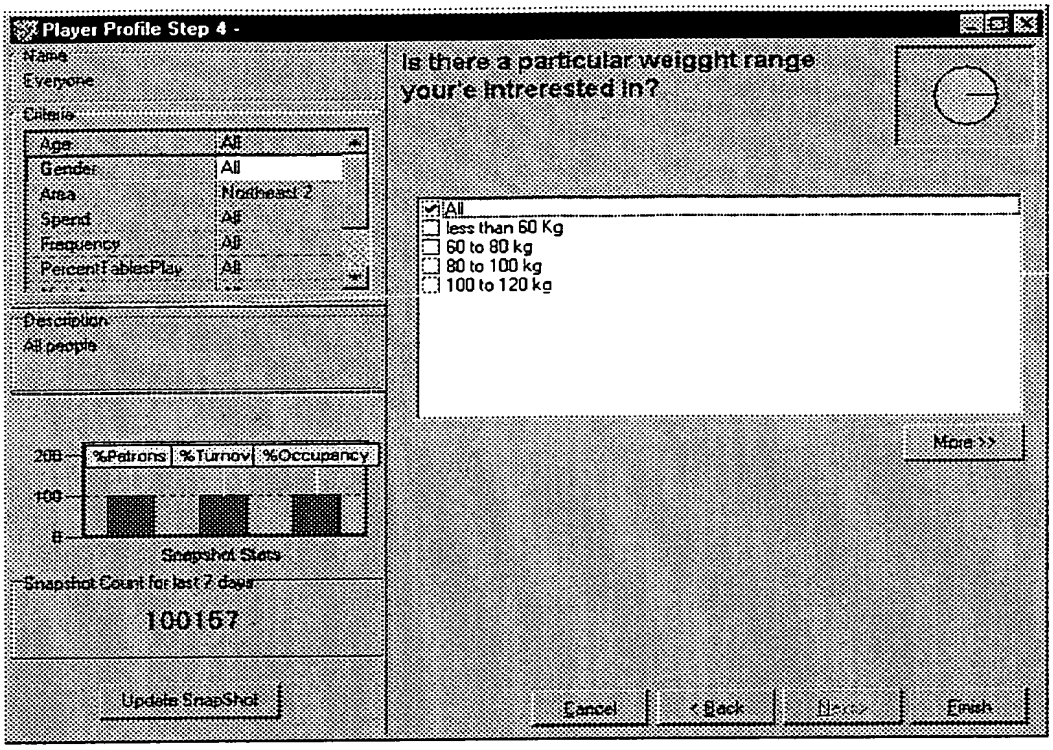

FIGURE 5

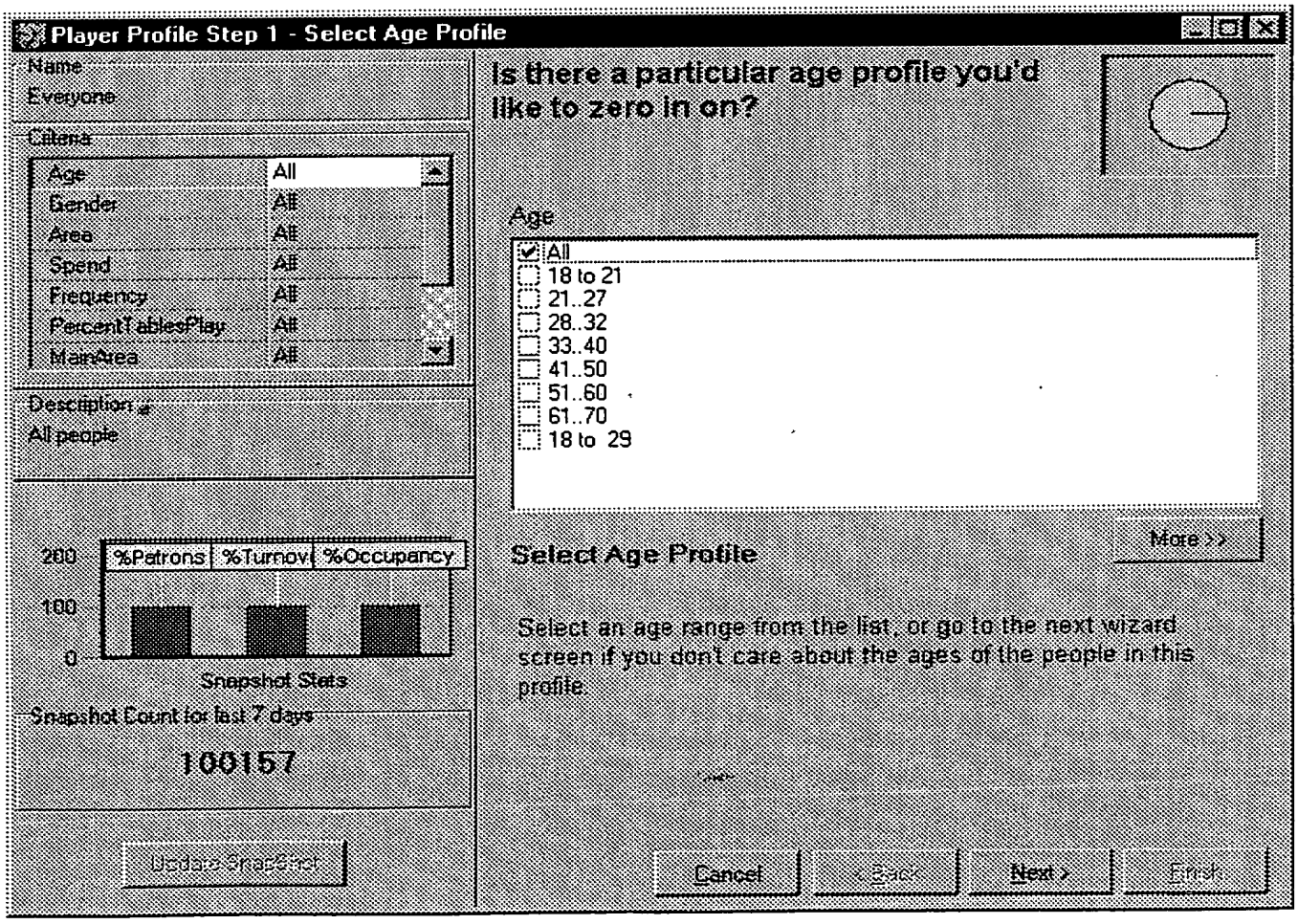

FIGURE 6